

Spatial variation of soil gas Rn, Tn and CO₂ in the Liupan Shan fault, central-north China and its tectonic implications

YING LI¹ JIANG YANG² ANHUI SUN³ ZHI CHEN⁴

¹⁻⁴ Key Laboratory of Earthquake Prediction (Institute of Earthquake Forecasting, China Earthquake Administration)

¹ subduction6@hotmail.com

² jeromemuyi@163.com

³ sah@seis.ac.cn

⁴ dugu_830822@163.com

The present work is proposed to investigate the spatial variations of soil gas geochemistry caused by different active intensities at the segments of Liupan Shan fault, located at the northeastern margin of the Tibetan Plateau. Soil gas Rn, Tn and CO₂ were measured at 773 sampling sites along 8 profiles across the Liupan Shan fault, central-north China in 2013. The results of soil gas surveys reveal that spatial distributions of Rn, Tn and CO₂ at the 8 studied profiles were different from each other, which was attributed to the fault activity at certain segment of Liupan Shan fault. However, the average values of Rn, Tn and CO₂ concentrations attained at the 8 profiles which represents the degassing intensity of the fault, show an increasing trend spatially from north to south along the Liupan Shan fault, which could be correlated to the larger horizontal dislocations of the north segment identified by earlier seismic geology study. The relative coefficient K_Q of Rn activity attained in profiles ranges from 2.55 to 8.13 and that are higher in central segment than the other segments, indicating a more intensive tectonic activity in the central segment of Liupanshan fault. Seismic wave tomography research is carried out and the result shows that the upper crust in north and central segments is fluid enriched, which indicates that the soil gases attained near the surface could be originated from the crust and migrate up through the faults and cracks. Our results indicate that soil gas is a good indicator for fault activity and more attention for seismic monitoring should be paid to the central segment of the Liupan Shan fault in future years.

This work is financially supported by the Natural Science Foundation of China (Grant No. 41573121).